Cardio Control NV
Medical Diagnostic Workstation

The ABP Perfect module: User's manual

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1. Introduction

Welcome

Welcome to the ABP Perfect Module of the Medical Diagnostic Workstation. This module offers you an easy way to record, view, edit and print 24 hours ambulatory blood pressure tests.

About this manual

This manual describes the use of the ABP Perfect module. In the next chapter the installation of the hardware is being described. If you have already connected the hardware you can skip this chapter and start with chapter three which discusses the recording of a new test. In the subsequent chapters the viewing, printing, module tools and other possibilities of the program are described.

Notations used in the manual

Throughout this manual the following notations are being used:

Dialogs:

- The names of dialogs, windows and tabs are displayed between ‘single quotes’.
- When referring to check boxes in dialogs, selected means that a check is displayed in the check box, and therefore that the option is on.
- When referring to a certain button, setting or menu option the text in this control is displayed in *italic*.

Keyboard:

- All key names are shown in capital letters between brackets. For example, the Control key is shown as [CTRL].
- Keyboard combinations are denoted by a plus sign (+) placed between key names. For example, "press [ALT]+[X] means that you must press and hold down the ALT key and at the same time press the X key.

Mouse:

- The left mouse button is the primary mouse button (unless you have configured it otherwise.)
- "Point" means to position the mouse pointer until the tip of the pointer rests on the item you want to point to on the screen.
- "Click" means to press and then immediately release the mouse button as you move the mouse. This action is always performed using the left mouse button unless specified otherwise.
- "Double-click" means point to an item, and then quickly press and release the mouse button twice.
- "Drag" means to point and then hold down the mouse button as you move the mouse.

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2. Setting up the system

ABP Perfect is basically made up of two elements: the hardware and the software, which runs on the computer to which the hardware is connected. Before you can start to record ambulatory blood pressure tests with the Medical Diagnostic Workstation software, the ABP device needs to be connected to the computer and the software must be properly configured.

Connecting the hardware

To connect the ABP device to your PC do the following:

1. Turn off the ABP device.
2. Connect the interface cable to the data connector of the ABP device. (every time when you connect or disconnect the cable from the data connector you have to turn off the ABP device).
3. Connect the serial connector of the interface cable to a free serial port (or COM port) on your PC.
4. Turn on the ABP device.
5. The ABP device is ready when ‘co’ is displayed on its LCD display.

Now the software needs to be configured so that the program knows to which serial port the ABP device is connected.

Configuring the software

After connecting the ABP device to your PC you need to configure the software. The most important setting to adjust is the COM port number that specifies to which COM port the ABP device is connected.

1. Select Workstation → Settings → Ambulatory blood pressure…
2. In the ABP Perfect settings select the ‘Advanced’ tab.
3. Select the COM port to which the ABP device is connected to.
4. Press the *OK* button to save your settings.

The system is now ready for use.

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3. Recording of a test

Before you can start recording a new ABP test, you should first select an existing patient or create a new one.

Starting a new test

After you selected the patient you can start a new test in several ways:

- By clicking on the new Ambulatory blood pressure button
- Selecting Workstation → New → Ambulatory blood pressure
- By pressing [SHIFT]+[CTRL]+[B]

ABP Perfect now starts to communicate with the ABP device.

If the device is new to the database the 'Name new device' dialog appears:

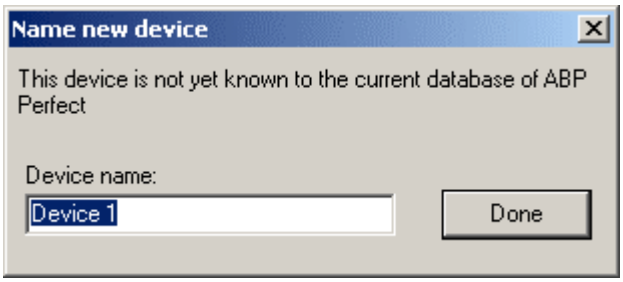

Figure 1: Dialog 'Name new device'

After the device has been named and the *Done* button has been pressed, the device is stored into the database so that a doctor or a technician knows at any time which devices are assigned to which patients (see chapter 'Device overview').

Device preparation

The device has to be prepared prior to the test recording. When the test is started several different situations can occur. We will explain each of them in a detail.

Situations that may occur can be divided in two groups according to the device data:

- Device is empty
- Device is not empty

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Device is empty

If the ABP device is empty, so there is no data in it, the following dialog will be displayed:

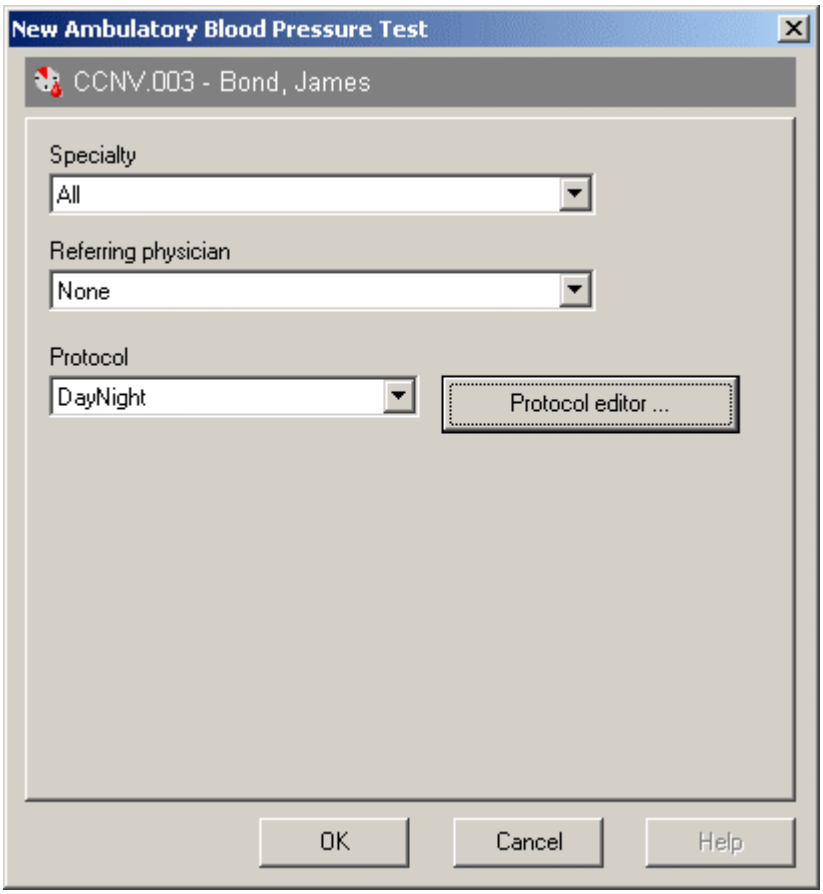

Figure 2: Dialog 'New Ambulatory Blood Pressure Test'

Specialty, referring physician can and the protocol has to be selected.

The most important item on this dialog is the protocol. The protocol 'tells' the device when a measurement has to be recorded. You can select one of the existing protocols or a new one can be created. Editing and creating of the protocol is done with the protocol editor (see chapter 'Protocol editor'). To invoke the protocol editor press the *Protocol editor…* button.

By pressing the *OK* button the module stores the protocol, the patient ID and the time into the ABP device. Because the Patient ID is stored in the device the recorded data will be assigned to the appropriate patient when that patient returns. In that way it is not possible to assign one patient's data to another.

After the *OK* button has been pressed, ABP Perfect displays that this test is 'in progress'.

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Device contains measurements

If the device is not empty it has to be decided what will be done with the measurements. The measurements can be either stored into the database or deleted without database storage.

Where the data will be stored or to which patient it will be assigned depends on the patient ID which resides in the device.

The following situations can occur:

- The measurements belong to the current patient
- The measurements belong to another patient
- The measurements belong to an unknown patient

The data is the current patient data

When a new test is going to be recorded for a patient who already has a test in progress, the next message box will be displayed:

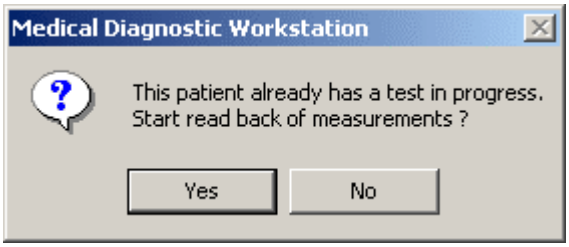

Figure 3: Message box 'Patient already has a test in progress'

By pressing the *Yes* button, the measurements will be read from the ABP device (see chapter 'Reading back measurements') and assigned to the patient's previous test.

By pressing the *No* button the following message will appear:

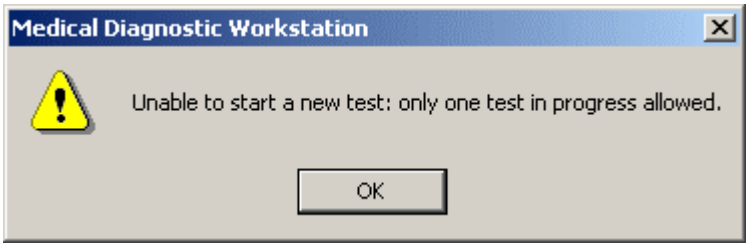

Figure 4: Warning message 'Only one test in progress allowed'

Note: it is not possible to start a new test for a patient who already has an in progress test.

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The measurements in the device are from another patient

If a new test is going to be recorded, but the data of another patient are still in the ABP device the following message box will be displayed:

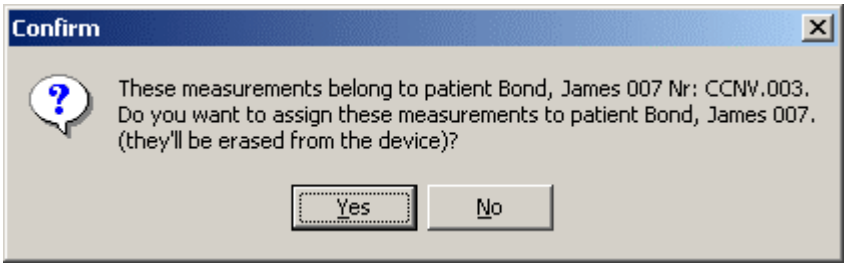
Confirm
These measurements belong to patient Bond, James 007 Nr: CCNV.003.
Do you want to assign these measurements to patient Bond, James 007.
(they'll be erased from the device)?
Yes
No

Figure 5: Confirm message box

By pressing the *Yes* button, the data will be assigned to the patient named in the message box and then the 'New ambulatory blood pressure test' dialog (see figure 2) will appear.

By pressing the *No* button 'Read back canceled' message will appear, the data will be erased from the device without being stored in a database and the 'New ambulatory blood pressure test' dialog will be displayed.

The measurements in the device belong to an unknown patient

If the measurements belongs to an unknown patient then the module will ask weather a new patient should be created – the patient card will consist only of a random unique Patient number.

The following dialog will appear:

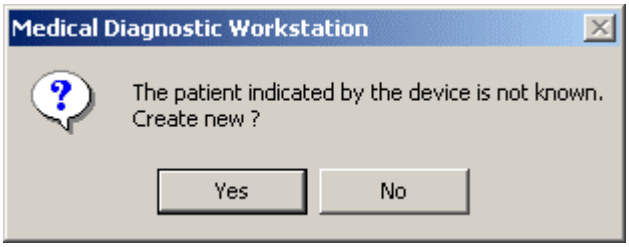

Figure 6: Message box 'Unknown patient'

By pressing the *Yes* button next message will be displayed:

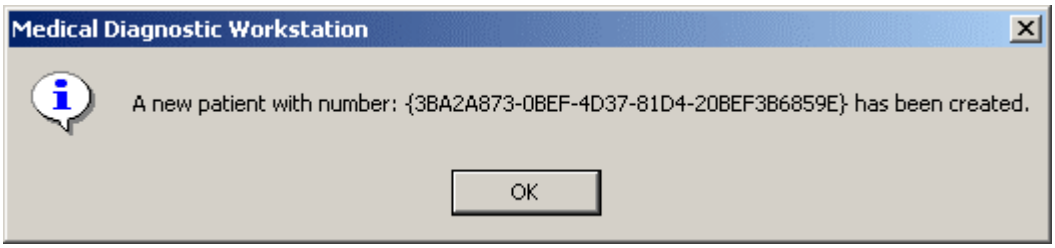

Figure 7: Message ' A new patient'

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When the *OK* button is pressed, the 'Confirm' message box will appear (see Figure 5).

By pressing the *No* button the same will happen as when pressing the *No* button in the previous section.

Reading back measurements

Preparing the ABP device for a new test is the first part of the test recording. When the ABP device is prepared, it is disconnected from the PC and the patient wears it for 24 hours. When the patient returns, the ABP device is connected to the PC again and the measurements are read by pressing the *Read measurements* button on the 'in progress' form.

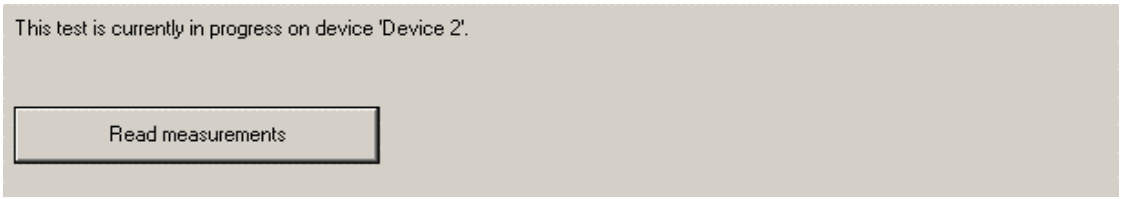

Figure 8: In progress form

The following dialog will appear by pressing the *Read measurements* button:

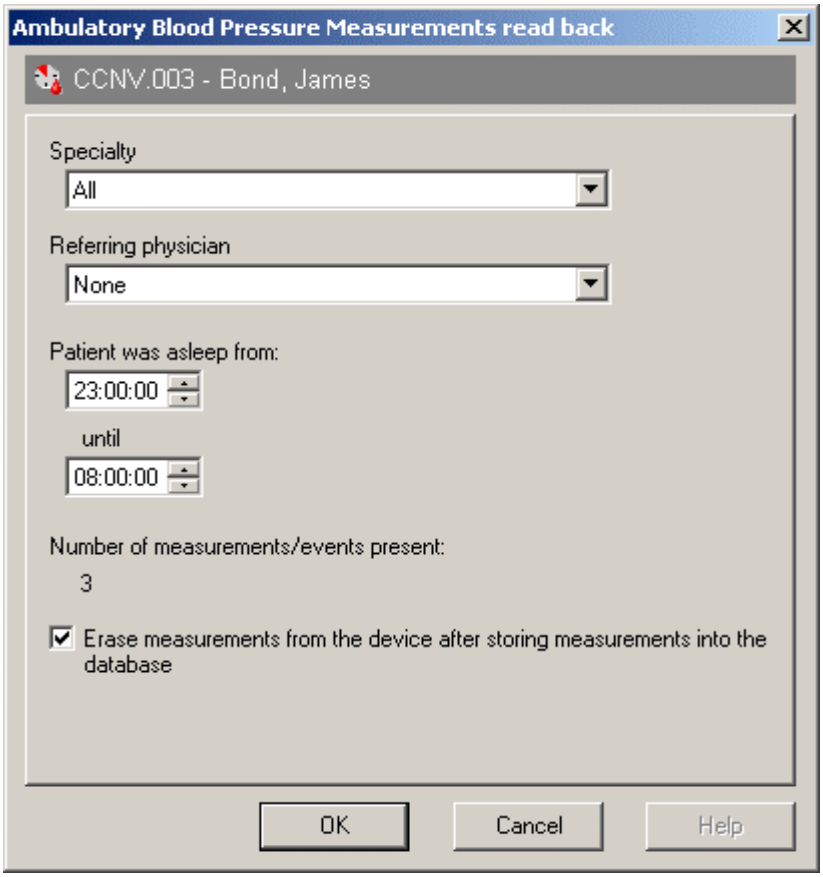

Figure 8: Dialog 'Ambulatory Blood Pressure Measurements read back

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Three new items can be seen here:

- A sleeping period of the patient – at what time a patient fell asleep and at what time the patient woke up
- A number of recorded measurements/events
- The erase measurements checkbox – if it is selected the measurements will be deleted from the device after they are retrieved into the module and stored in the database

By pressing the *OK* button the measurements and events will be saved to the patient named on the top label of the dialog.

Reading back of the measurements is canceled by pressing *Cancel* button. In that case the test still stays in progress.

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4. Viewing a test

The module can display an ambulatory blood pressure test in six different views:

- Measurements and events
- Hourly intervals
- Trends
- Summary
- Scatter points
- Raise and fall

Measurements and events

For each measurement the following values are presented: number, date and time of the recording, systolic pressure, diastolic pressure, MAP (mean arterial pressure), Heart rate, pulse pressure, RPP (rate pressure product = systolic pressure * heart rate) and comment.

Events consist of the number, date and time of event occurrence and comment.

A comment can be entered/changed by clicking on the comment area.
[ESC] will undo the previous comment action.

The red and bold values are values that are above the norm values.
The default norm values and the default sleeping time are defined in 'General' tab of the 'ABP Perfect settings' dialog.

Grayed measurements and events are measurements and events of the sleeping period of the patient.

Multiple measurements and events can be selected by dragging with the mouse or by pressing [SHIFT] + [↑] or [SHIFT] + [↓].

By pressing the right mouse button a popup menu will appear with three items:

- Set awake
- Set asleep
- Delete

Set awake will set selected measurements into the awake period of the patient, set asleep will set them into the patient's asleep period and delete will delete the measurements.

Hourly intervals

The average values of systolic pressure, diastolic pressure, heart rate and corresponding standard deviations are calculated for one hour, two, three, four, six or eight hours.

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Trends

This is a graphical representation of the ambulatory blood pressure test. On the upper chart systolic pressure, MAP and diastolic pressure are displayed along with the norm values. On the chart below the heart rate is presented.

The grayed part of the charts denotes the sleeping period of the patient.

Summary

General, systolic pressure and diastolic pressure statistics are represented for all measurements, measurements of the patient's awake period and measurements of the patient's asleep period.

General statistic consists of:

- Number of measurements
- Total time of the recording
- Average blood pressure
- Standard deviation of the blood pressure
- Average pulse pressure

Systolic and diastolic pressure statistics consist of:

- Number of measurements greater or equal to the value in the checkbox (norm value).
- Minimum value
- Maximum value

Decrease is the decrease of the blood pressure of the patient in the sleeping period with regard to the blood pressure of the patient in the awake period.

Morning average is the average of the blood pressure in the first awake hour after the sleeping period.

Scatter points

Four charts display correlation between following values:

- Systolic pressure against heart rate
- Diastolic pressure against heart rate
- MAP against heart rate
- Systolic pressure against diastolic pressure

One point of the chart represents one measurement. Black points are 'sleeping' measurements.

Each of the correlations can be viewed for all measurements, sleeping measurements or awake measurements. For that purpose there are three tabs: Overall, Awake and Asleep.

Clicking with the right mouse button on any chart, a popup menu will appear with two items:

- Enlarge
- Reset zoom

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Each chart can be enlarged by pressing the enlarge item of the popup menu, by double clicking on it or by pressing the corresponding button.

By dragging the mouse over the chart from a point in the chart toward the right bottom corner of the chart, zoom area can be selected.
Zoom can be reset either by pressing the 'Reset zoom' item on the popup menu, which will also reset the zoom for all charts, or by dragging the mouse from a point in the chart toward the left top corner of the chart.

Rise and fall

This view consists of two charts. The upper chart differs from the upper chart of the trends view in one additional red curve. The red curve is obtained by filtering the MAP curve.

Applying a first derivation on the filtered curve of the upper chart, the curve on the lower chart is obtained where the rise and fall of the blood pressure can be clearly seen.

5. Printing of a test

For each test printouts can be obtained for the following views:

- Measurements
- Trends
- Summary

Click on one of the above mentioned views and press the *Print* button.

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6. Tools

This chapter describes the tools of the ABP Perfect module.

There are three different tools:

- Protocol editor
- Device overview
- Error list

Protocol editor

With the protocol editor you can edit an existing protocol or you can create a new one. When the 'New ambulatory blood pressure' dialog is displayed the last edited or created protocol is selected in the protocol combobox.

The protocol editor can be invoked in two ways:

- By pressing the *Protocol editor…* button on the 'New ambulatory blood pressure' dialog (see Figure 2).
- By pressing Tools → Protocol editor …

As you can see on the following figure, the protocol editor consists of several items. Three of them will be mentioned:

- Protocol tree view
- Time intervals grid
- Show measurements on device

The first two items will be explained later in a detail.
If the 'Show measurements on device' check box is selected then the measurements will be displayed on the LCD display of the device right after the measurement is recorded.

Protocols treeview

In the protocols treeview you can see the protocols that are stored in the database. Selecting one of the protocols will display its time intervals on the time interval grid.
For each protocol the 'Show measurements on device' checkbox can be selected.

By pressing the right mouse button, the protocols popup menu will appear with two items:

- New
- Delete

You can change the name of the selected protocol by clicking one more time on it.

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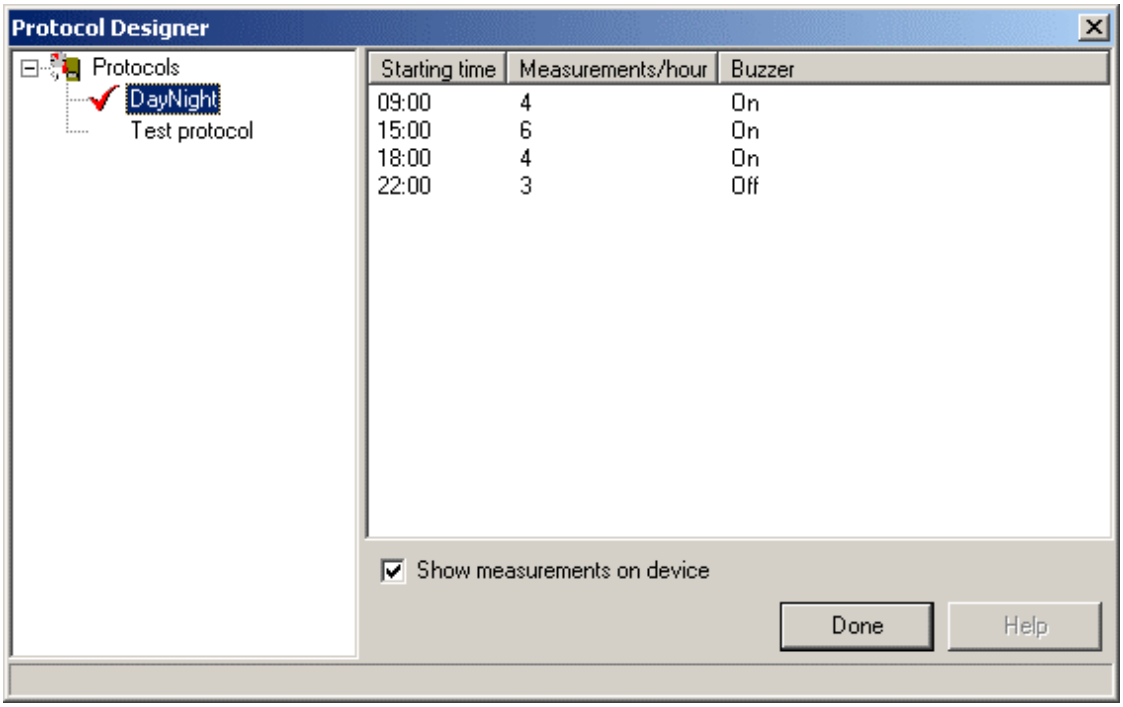

Figure 10: Protocol editor

Time intervals

Recording of an ABP test is conducted by the time intervals.

Each time interval consist of:
- Starting time
- Number of measurements per hour
- Buzzer on/off

There can be 1, 2, 3, 4, 5, 6, 10, 12, 15 or 30 measurements per hour. If you set it to 6 measurements per hour that means that the measurements will be recorded every 10 minutes.

The buzzer can be set to on to notify the patient that a measurement is going to be recorded in order to prepare himself/herself and in that way reduce the possibility of an error measurement.
If an error measurement occurs, a repeated measurement will be performed exactly three minutes after the error measurement.

By pressing the right mouse button, the time interval popup menu will be displayed with the following items:
- New
- Edit
- Delete

Creating and editing of a time interval will bring up the time interval dialog.

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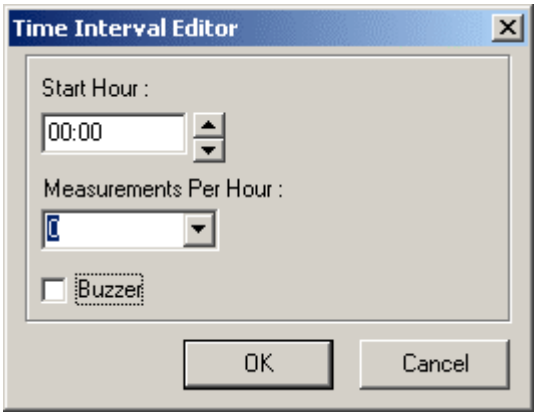

Figure 11: Time interval editor

Note: If the selected protocol is empty (it has no time intervals) it will not be stored in the ABP device, and the current protocol will be performed.

Device overview

Here you can see the ABP devices that are currently in use, the patients to whom they are assigned and the times when recordings have started.

It is invoked by clicking Tools → Device overview …

Error list

In the error list you can see the errors that can occur during the test recording.

The error list dialog consist of two items:
- Number of the error
- Explanation

An error can occur because of a number of reasons and most of them are listed in the explanation part.

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7. Abpm To Abp Perfect converter

This tool converts the tests recorded with IEM Ambulatory 24 hour Blood Pressure Monitor (ABPM) into the database of the Medical Diagnostic Workstation.

Start up Abpm2AbpPerfect.exe.

The following dialog will be displayed:

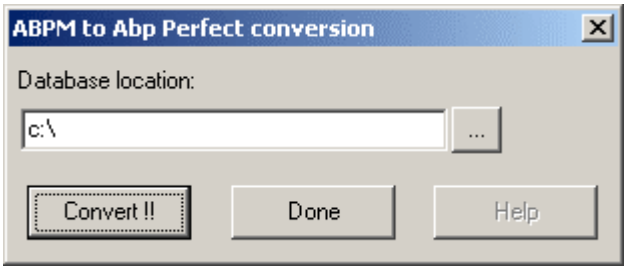

Figure 9: ABPM to Abp Perfect converter

All you have to do is to enter the database location of the ABPM database and press the *Convert* button.

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